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TEACHING INFORMATICS CONTENT AND MEANS IN THE ASPECT OF EDUCATION INFORMATIZATION

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Abstract

The process of education informatization acquires direct and inverse relationships with each of the components of educational process. The relations in the paradigm *informatization - informatization of education - educational subjects* become reversible, commutative, and cyclic. The knowledge of new informational technologies does not only mean subjects, having informational competence, but the knowledge of their social, juridical, consumptive properties, having the consumption culture and information interaction. New information technologies as resources and products of informatization of education become also a goal and a means of informational training in the sphere of teaching Informatics. The article deals with the interrelation between the Informatics teaching system, its content and means with the informatization of education. Accordingly the authors consider the expression of this relationship in the methodical system of teaching Informatics in its basic components. In their opinion, the methodical system of teaching Informatics can play the role of a meta-language in the field of the instructional system and information and education knowledge application.

Keywords: Informatics, informatization, content, means, security, culture.

1. Introduction

The issue of the place and extent of the use of information and computer technology is the understanding of how and in what way the human sensation is changing and will change to digital. But there's no doubt that the awareness of the potential of new computer technologies and global networking opportunities is a necessary characteristic of education and it is impossible for a modern person to do without these technologies.

2. Problem Statement

Attention to the school course of computer science has now intensified. Also, the attention of teachers, trainees, methodologists, and the public for the field of informatics increases. This is a result of the education modernization, its requirements and needs, the urge to seek innovative means, forms and methods for their implementation (Abdurazakov, 2015; Kuznetsov, 2015).

A lot of works of foreign (Henner, 2013; Gal-Ezer, Stephenson, 2014; Hubwieser, 2013; Barrett; Hubwieser et al., 2014; Wilson) and Russian (Abdurazakov, 2015; Kuznetsov, 2013; Kuznetsov, Monakhov, & Abdurazakov, 2016; Kuznetsov, Monakhov, & Abdurazakov, 2016; Korotenkov, & Lazebnikova, 2010; Robert, 2007) scientists, specialists and methodologists are devoted to the discussion of the problem of teaching the school course of Informatics and the methodological system of teaching this subject. In particular, the work emphasizes that "the content of the school course of Informatics should be based on its understanding as a fundamental science that studies information processes in biological, social, and technical systems" (Federal state educational standards).

A comparative analysis of foreign and domestic experience in teaching Informatics at a general education school shows that the vast majority of works are devoted to specific issues of content and methods of teaching Informatics. There is an extensive bulk of works (Informatics education; Report of the Académie des Sciences; The way forward for computing in UK schools) based on the results of discussion of the teaching Informatics problem, following the results of international conferences, for example, SIGCSE (ACM Special Interest Group on Informatics Education, ICER (International Computing Education and Research), ISSEP (Informatics in Schools: Situation, Evolution and Perspectives), ACM Transactions on Computing Education, etc.

Attention to the general subject "Informatics and ICT" is also increasing under the influence of the new the second generation educational standard regulations (Federal state educational standards). The question is whether these generation educational standard regulations can be considered as a reaction to the requirements and needs of education in the context of updating the education content and informatization of its all levels of education

3. Research Questions

Many experts believe that at present only the computer and computer-based technology will allow for a qualitative breakthrough in the educational system. But at the same time they note, that, obviously, the computerization of education cannot solve all the problems of education, but computer's potential

shouldn't be underestimated. Nevertheless, the use of computer technology in education gives the following advantages.

In the *first* place, computer technology significantly expands the possibilities of representing the educational information. The use of color, graphics, animation, sound, all modern multi-media means enables us to create the real situation of an activity. Computer's visual capabilities don't give way to those of cinema or television.

In the *second* place, computer technology reinforces the motivation of learning. It's not only the novelty of working with a computer, which often itself increases the interest to learning, but the possibility to regulate the difficulty of the presented learning tasks, realizing the basic principles of differentiation of learning.

In the *third* place, computer technology actively involves students in the learning process.

In the *fourth* place, it allows to greatly expand the sets of applied training tasks. Thus, computers are effectively used for such training assignments as simulating various situations, for the diagnosis.

In the *fifth* place, computer technology allows for a qualitative change in learners' activities control, at the same time providing the flexibility of managing the learning process. In addition, once an error is detected in tested answers, its character can be determined as well, which further helps to eliminate the causes of that mistake.

The learners' activity is first of all connected with training. The content of training should not only reflect the current level of scientific and social progress, but also contribute to a more effective development of the person's personality. There are new approaches to the organization of training and the very process of forming the knowledge, skills and IT-competence of learners.

The problem is finding an answer to the question of how to build computer science education in a general education school in the context of implementing the requirements of the new educational standard and how the global process of society and education informatization affects the content of the methodical system of teaching Informatics at the school.

4. Purpose of the Study

Becoming a part of the educational process and the sphere of education it has produced, the informatization of education acquires direct and inverse relationships with each of its components. The relations in the paradigm *informatization - informatization of education - educational subjects* become reversible, commutative, cyclic.

Current research shows that new information technologies as resources and products of informatization of education are also a goal and a means of informational training of the subjects of education, teaching Informatics.

Their grasping of subjects of teaching implies the need for their representation in the content of subject education, in the content of teaching Informatics. Fundamentalization of teaching Informatics implies its reliance on the resources of the informational and educational sphere, the availability of a sufficient number of informatization of education resources.

5. Research Methods

The methods the research team used are as follows: qualitative analysis of the Russian and foreign state regulations in the field of education; literature on the theme of the content and means of the Informatics teaching system in order to define pedagogical compounds of the system with its own scientific and methodological features.

6. Findings

The general conclusion that can be made from the analysis is that the school course "Informatics and ICT" in the Russian Federation has been established and preserves as an independent academic subject. This is because:

- the status of Informatics as an independent subject included in the compulsory part of general school education has been determined;
- There is state support in the form of methodical Informatics teacher training system at universities, where an important (perhaps leading) part is played by the university's theory and methodology of teaching Informatics.

The informatization of education is directly relevant to the teaching of Informatics and the methodical system of this teaching as:

- an area providing informational training tools (a component of the methodical system "Means");
- a teaching content (a component of the methodical system "Content"), implemented as an effective, rational, lawful and safe use of IE resources.
- a component of the informational and educational environment, society informatization, designed for education, directly affecting the Informatics teaching and its results, its teaching methods.

The modern pedagogical science, views the informatization of education in two methodological aspects, ***technological and psychological-pedagogical***: as a "focused process" and as a specific "new field of pedagogical knowledge integrating the scientific trends of psychological, pedagogical, social, physiological and hygienic, technical and technological research, having certain interrelations in itself and forming a certain integrity" (Robert, 2007).

In accordance with this definition, informatization of education as a scientific and methodical system (the field of pedagogical knowledge) becomes an ***active system of cross-curriculum interaction*** in the field of pedagogy and the development of cross-curriculum ties in the field of education, in subject teaching (with Informatics, Social and Juridical Informatics and many other educational subjects) (Korotenkov, & Lazebnikova, 2010).

Informatization of education is a complex of purposeful factors, phenomena, processes for solving all the issues and the implementation of all types of educational and pedagogical activities related to information, data and knowledge, informational and technological or scientific and methodological equipment, formalization and abstract notions, appropriate organization and management. Informatization of education is represented as an integral structured process of achieving the goals of education through

the global informatization and the society advancement, the performance and development of its achievements in education.

The knowledge of new informational technologies does not only mean subjects, having informational competence, but the knowledge of their social, juridical, consumptive properties, having the consumption culture and information interaction. Hence, the "*pedagogical aspect*" of the informatization of education tends to be continuously expanded, including scientific, methodological, educational, social and cultural, juridical and other components as well.

The position of the methodical system of teaching Informatics is an inner position as an active subject of the of informatization of education, and a position from outside as a consumer of its products (the subject of education and its scientific and methodological system), not only demanding, but also creating conditions for optimizing this consumption.

The areas of interest of the methodical system of teaching Informatics are:

- creation of informatization of education resources (information educational resources), their legal registration;
- the productive use of these resources, their introduction into the teaching of the subject of informatics as its means;
- development of informational competence and personal informational culture of subjects of teaching through the subject study and independent work with the resources of the informatization of education.

As a part of the external environment for the methodical system of teaching Informatics, informatization of education has a strong interaction with it, which is reflected in all components of the system - goals, methods, content, etc. It is not only one of the main sources of educational resources, educational and instructional technologies, but also a source of methods for their creation and implementation.

As an *internal factor* of the methodological system of teaching social and juridical informatics it is the projection, the image of the informatization of education and the methodological system of the informatization of education in this system:

- reflection in the aims and results of training;
- reflection in the content and methodology (approaches, principles, methods);
- reflection in the informatization of education means in the teaching means and methods of use (consumption) informatization of education resources;
- reflection in personal results, in the subculture of work with information and resources of the informatization of education.

That is, the scientific and methodical system of informatics, which, firstly, is connected with all its components (develops with them), and secondly, has a close connection with all the conceptual trends of the methodical system of informatization of education.

As the scientific and methodical systems, informatization of education and teaching social and juridical Informatics become not only active systems of cross-curriculum interaction in the field of pedagogy and the development of cross-curriculum communications in the field of education in subject teaching, but also active interactive systems developing its methodology.

Hence, the position of the scientifically methodical system of teaching Informatics is an inner position as an active subject of the informatization of education, and a position from outside as a consumer of its products (the subject of education and its scientific and methodological system), not only demanding, but also creating conditions for optimizing this consumption.

The areas of interest of the methodical system of teaching Informatics are:

- the creation of information educational resources, their legal registration;
- the productive use of these resources, their introduction into the teaching of the subject of Informatics as its means;
- the development of informational competence and personal informational culture of subjects of teaching through the subject study and independent work with the resources of the information educational.

For the informatization of education from the standpoint of the methodology of teaching Informatics, in the aspect of optimal formation, consumption and security of the complex of resources, the following is necessary:

- Consideration of information and educational resources (IER) in an integrated relationship, systematically as well as their classification according to uniformity and specification.
- The description of the IER as products of creative work, informational products in the aspect of its production and consumption, in terms of rights, duties, responsibilities.
- The definition of the IER role and place as an integrated informational and educational resource in the system of informational education.
- The development of all forms of educational and informational interaction based on the implementation of intra-subject and cross-curriculum communications.
- The creation and usage of subject models, informational models of learning and cross-curriculum interaction.
- The implementation of all available methods of scientific and informational cognition, means of scientific and applied systems, creation and application of new forms of education and teaching methods corresponding to the purposes, processes and results of informatization.

The quality of educational resources (informational, electronic, multimedia) is assessed not only by their technological, cognitive, pragmatic advantages – this certainly remains important for them. It is also estimated by the presence of a methodical component aimed at reproduction of the knowledge embedded in them, at the organization of the process of this perception.

The content model of the educational subject of Informatics is the *content* that constitutes the basic level of learning it. It´s sufficiently adequate reflection in the training will ensure the formation and development of students' informational competence, the result of their learning and the ability to learn. The student's conscious ability is a product of his perception of the content and the ability to reproduce the means of activities based of personal knowledge and active cognition. It is the systematic representation of the content model in the scientific and methodological system of teaching the subject that makes it possible to achieve adequacy of reflection, efficiency, and rationality of education.

Informatization is considered, in the first place, as a determining factor of the development of society. Its expression is found in informational education, in teaching Informatics. In modern education the reflection of the cognitive factor of informatization, informational and technological means, processes

and management of the operating environment still prevails. However, security, the informational environment security, social and human security, implying its maintenance and prevention of threats are vital for the sphere of informatization.

7. Conclusion

Thus, the problems of development and security of the informational environment, the sphere of informatization, and informational interaction should be considered in informational education as an integrated unity, a systemic relationship, in the aspect of social and legal Informatics.

The content of teaching Informatics as a component of its methodological system includes the following statements:

- adequate and fairly complete reflection of the theory of informatics, knowledge, concepts, content and forms of expression;
- meta-subject description of informatics, its components and subject as the matter of scientific-cognitive systems;
- characterization of the inter-subject role of informatics in the scientific and educational sphere;
- reflection of the invariant properties of the general socio-informational environment, its objects, processes and relationships in the aspect of their implementation and optimization;
- reflection of the main problems of the social and informational environment and the principles for their solution.

The methodical system of teaching Informatics can fulfill the role of a meta-language in the field of the methodical system and information and education knowledge application. In particular, its goals include:

- Definition of principles and the order of consumption of informatization of education products, informational and educational resource; their reflection in the content of teaching Informatics.
- Development of methodology (principles, models) for the creation of informational educational resources, methods for informatization of education funds preparation and implementing in teaching.
- Forming a model for the development of the subculture of working with informatization of education resources and informational and educational resources.

Consequently, as the scientific and methodical systems, the informatization of education and the teaching of Informatics become not only active systems of cross-curriculum interaction in the field of pedagogy and the development of cross-curriculum communications in education, in subject teaching, but also by active interactive systems developing their methodology.

Acknowledgements

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